INTERNATIONAL HEALTH EXHIBITION

Supplements to The Builder.

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THE AQUÆ SULIS OF BATH.

BEFORE proceeding to notice the exhibits in Class XXXI., Baths, Wash-houses, &c., which will be found displayed for the most part in the East Central Gallery (C), we may fittingly describe the very interesting contribution sent to the Exhibition by the Corporation of Bath, and which will be found in the South Central Gallery amongst the completely-fitted apartments.

The thermal waters of the beautiful city of Bath have undoubtedly a right to admission in any exhibition relating to the subject of health. The remote antiquity of its hot baths, their unsullied reputation for curative properties, the long-continued fashionable character of its pump-room, and the medicinal qualities attributed to its mineral waters, as well as the curious legends attaching to the discovery of its ever-flowing thermal springs, dating back to nigh upon two thousand years ago, combine in giving an interest of no usual kind.

The view of its many streets of white stone houses, mounting up the slopes of the steep hills rising 600 ft. or 700 ft. from the lovely valley of the Avon, is a sight once seen never forgotten. All that is lovely, healthful, and attractive may be said to be concentrated there. To the builder its fine white freestone has been a material of the utmost value, and has been almost universally employed for realising in the erected fabrics of our churches and public edifices the highest conceptions of architects of Mediæval and modern times, almost since sculptured ornamentation in mouldings and traceries was first conceived. The Corporation of the City, thoroughly imbued with a proper estimation of the value of their remarkable natural springs and of the wonderful antiquities with which they are associated, as well as duly appreciating the benefits accruing to the town from them in riches, and to the thousands of patients in relief for various ailments, have contributed an exhibit which is thoroughly worthy of the occasion and of the ancient and present fame of Bath. In a very large model, on a scale of 4 in. to 5 ft. singularly well executed, there are shown superposed or exposed, in due relation to each other, the modern Baths, Pump-room, and Hotel, and the antique Roman baths and hypocausts already exhumed to more than double the extent of the modern buildings. The present Pump-room, we may say,—for the benefit of those of our readers who are not acquainted with Bath and its institutions,—is 83 ft. in length by 68 ft. in width and 44 ft. in height, with a façade relieved by Corinthian columns and having a colonnade on each side. It is used as an assembly-room for subscribers and visitors, where the medicinal waters are drunk, and in which the bathers from the hot baths remain for a time before going into the open air. Adjoining the Pump-room are the King and Queen Baths, consisting of a series of bathing-rooms around a central circular bath. In the angle of junction between these edifices there juts out another large bath known as the King's Bath,—the most interesting of all the baths, as being over the site of those ancient springs, the discovery of which tradition assigns to King Bladud, who, whilst a leper and an outcast, finding his pigs, to which he had communicated his loathsome disease, cured by wallowing in the hot mud deposited by them, successfully applied the same natural remedy to himself. These springs,—which rise at a temperature of 117° Fahrenheit,—were enclosed by the Romans in a leaden basin, which again was surrounded by a large octagonal masonry well, 50 ft. in diameter, and lined over its interior walls with sheet-lead. Some twenty or thirty tons of this have, at a recent period, been taken away and sold,—the lead being rich in silver,—and the funds applied to the excavations. These Roman antiquities still remain under the floor of the King's Bath, which has been built over them on arches; the waters from the springs now flow over a breastwork, rising about 5 ft. or 6 ft. above the modern floor and running from it into the surrounding bath. Adjoining the King's Bath is the Queen's Bath, of the same date as the former. Under the Queen's Bath is another Roman bath of more than corresponding extent; and in line with this is the great Roman bath, 83 ft. 8 in. in length by 40 ft. 2 in. in width, rectangular in form, with stone steps descending on every side into the water, which, in the Roman days, rose to 5 ft. 10 in. above its floor. The hot water from the springs flowed into this magnificent pool, along the sides of which were twelve massive masonry piers, six on each hand, of rectangular section and noble proportions. All round the bath was a wide platform or pavement, and in the surrounding walls were two rectangular and four semicircular recesses, the total dimensions of the edifice being 111 ft. 4 in. by 68 ft. 6 in. Beyond this great bath again was yet another fine bath of like dimensions, with the one at the opposite end beneath the Queen's Bath. These old Roman baths have been largely excavated, some portions being exposed to view, and some portions lying under the Kingston Buildings and the Poor Law Board's Offices, the underpinning of which is marked out in the model by lines of copper pins.

Still further eastward adjoining the bath last noted are the remains of large buildings with hypocausts below the ground-floors. That similar remains extend thence to the northward is known, as the south wall of the abbey church is built upon the north wall of yet another large Roman bath. The excavations are still proceeding, the scene of the present labours being in the opposite direction, namely, to the eastward of the Queen's Bath, where, in the vicinity of York-street, some most interesting discoveries are being made. The total area, explored and unexplored, over which there are evidences of the ancient Roman baths and their contiguous buildings, is no less than 300 ft. by 190 ft., giving a superficial area of 57,000 square feet. The quantity of water flowing naturally, and being pumped at the present time, is equal to 385,000 gallons daily; and as the natural supply still comes from the old Roman springs, it may be assumed that there has been no alteration whatever in the outflow. In another part of the City of Bath there is a celebrated cold spring, called "Winifred's Well," and the water from it is to-day, as it was in Roman times, conveyed to the Thermal Baths, and used for cooling the temperature of the unbearably-hot water from the thermal springs. In the old Roman great bath, the jets from the springs seem to have been sprayed into the bath, probably for the like purpose of reducing the temperature.

At the farther end of the model there is a representation of other modern baths attached to the Royal Baths Hotel, and which are admirably designed for the wants and requirements of patients. These baths and their adjoining rooms constitute one wing of the hotel, which is situated at the opposite side of the street to the Royal Baths themselves. The bathing-pool is designed chiefly for ladies, and is 80 ft. long by 25 ft. in breadth deepening gradually from 3 ft. 3 in. at one end to 5 ft. at the other. On each side are separate dressing-rooms, and at the ends are the general rooms. On an upper floor surrounding the Bath Hall are special rooms for invalids under special treatments; among these are provided reclining-baths, douche-baths, and chair-baths, in which latter case the cripple or patient unable to walk can be craned into and out of the water. Nothing is left unprovided here for the comfort or convenience of the bathers.

Not only has the Corporation, under its learned and talented officer, Major C. E. Davis, F.S.A., the City architect,*—to whose energy and ability is due the successful prosecution of the excavations during the past ten years,—made grants in support of the work, but the Society of Antiquaries have helped in the work, and other aid rendered by public and private subscriptions,—contributed such a splendid model so conspicuous for the most interesting information it affords, but it has supplemented this by a valuable Museum of Roman antiquities and by a collection of photographs and paintings which in themselves afford a curious history of the baths from ancient to modern times. Amongst the portraits are those of Beau Nash, the conductor of the fashionable crowd of the last century, and of Dr. Oliver and Mr. Pierce, the physician and the surgeon, whose efforts and recommendations contributed so much to re-establish for the waters of Bath their ancient renown.

SANITARY FITTINGS.

CONTINUING our notice of the exhibits in Class XXIII., so far as they are to be found in the Eastern Annexe, we note that Messrs. R. F. Dale & Co. (Stand 516), of Bear-lane, Southwark, have a very satisfactory display of serviceable goods. Foremost amongst their exhibits we must name their speciality, the "European" side-outlet valve closet, which well merits the attention of visitors. It is claimed for it that it combines in one apparatus all the advantages of the flush-out and valve closets, avoiding their individual defects. The construction of the overflow is so arranged that it is not easy to conceive of its failing or becoming blocked. The outlet being central with the basin, this closet can be fixed in the place of an old Bramah or pan closet. The valve hinges backwards, so as to be clear of the discharges from the basin. The closet is made either with a galvanised iron trap and a pottery-basin, or with the trap and basin in one piece of glazed earthenware. The same exhibitors show in action a syphon water-waste preventer with instantaneous action; these cisterns give a good after-flush. For the "Southwark" ball-valve, shown by the same firm, the advantages claimed are that it runs full-stream until the cistern is nearly full, and that it has been tested to stand 300 ft. head of water. It has no cup-leathers and no stuffing-box, and it is further alleged in its favour that it cannot set fast.

Mr. James Robertshaw, of Manchester (Stand 517), shows Turner & Robertshaw's patent "Dividable" closet, or dry-pail system. By this invention it is sought to separate the liquid from the solid matter, whereby fermentation is prevented. The pail stands on a sanitary tile bottom, on the upper surface of which is a semicircular raised flange, which allows of the position of the pail being so adjusted that the hole in the bottom of the vessel comes exactly over the hole in the tile-bottom, in which there is a grid through which any liquid finding its way into and through the pail will pass into a syphon trap. But it is claimed that the pail is relieved of about fifty per cent. of liquid by means of a specially devised urine-guard of galvanised iron or earthenware, which deflects the

* We may perhaps be thanked by some of our readers for calling their attention to Major Davis's book entitled "The Bathes of Bathe's Ayde in the Reign of Charles II.," which was reviewed by us in our last volume (see p. 304), and which contains a great deal of interesting information about the Baths. Some additional particulars of the Roman remains will be found in the *Builder* for Sept. 2, 1882, p. 319.

liquid and conducts it by a down-pipe directly into the syphon trap before mentioned. It is claimed that the solid contents of the pails can be readily emptied and dealt with or utilised without being subjected to any burning or drying process. Of course house-slops should not be thrown into these receptacles; but as a matter of fact they are often so disposed of, and in order that they may pass off readily into the drain, a perforated channel is formed at the side of the pail, in addition to the perforated false bottom with which the receptacle is provided. These closets are stated to have been used in Batley, Ashton-under-Lyne, Tunstall, and other towns, with good results.

Stand 518 is occupied by Mr. William Whiteley, Bayswater, who, desirous of worthily sustaining the *rôle* of "universal provider," has not lost sight of some of the means for making dwellings healthy. True it is that most of his exhibits are the manufactures of other firms, but they are good of their kind and bespeak soundness of judgment in their selection. None the less, however, will Mr. Whiteley's encroachment on the domain of plumbers and sanitary engineers be resented in some quarters. The mention of "sanitary engineers" leads us to point out, us we have done on previous occasions, that it is not every one who uses the title who can justly claim it. Too often it is merely "plumber"—and sometimes indifferent plumber,—writ large.

Mr. Thomas Waller, of Fish-street-hill (Stand 521) exhibits his patent ventilating arrangements for water-closets and urinals. A water-closet constructed on Mr. Waller's system has the casing-in so arranged that a current of air is always passing through it and across the top of the basin, so as to carry off any effluvia that may arise from the apparatus. The flap, or cover, is made to slope downwards, the exhibitor's theory being that it thus acts (when shut down) in the same manner as the "blower" to a fireplace. When the lid is shut down, an opening, leading into a ventilating shaft, is left at the back of the casing (above the level of the hole in the seat) so as to carry off any foul smell that may be given off from the basin. When the lid is raised it closes this opening. The urinals shown by the same exhibitor are ventilated by means of fresh-air inlets in the floor, and by the provision of louvred openings for extraction purposes above and below the basins.

Stand 522 is occupied by Mr. George Jennings, of Stangate, whose productions are among the best of their kind in the Exhibition. A useful apparatus, which we think we have mentioned on a previous occasion, is the lift-up closet for use in large establishments. This consists of a strong iron hopper and trap, enamelled inside, and fitted with a wooden seat so counterweighted that it flies up when released, leaving the hopper available for use as a urinal or slop sink without discomfort to subsequent users of the closet. The iron hopper and its counterweighted seat constitute the whole of the apparatus, a strong flush of water being obtained every time the seat is raised or lowered. No casing or boxing-in is necessary, and the closet takes up little space. A new water-waste preventer for giving a good after-flush to water-closets was being fixed at the time of our visit. We have not seen this in action, but from what we hear of it it would seem to embody an improvement of great value. Some very good valve closets are shown at this stand, besides Jennings's cottage-valve "Monkey" closet, which is a "wash-out" closet, in all essentials the same as that introduced by the late Mr. Jennings a good many years ago, which was the precursor of many of the "wash-out" closets now in the market. Seat-action and door-action water-closets and urinals of different kinds, go to complete a very useful lot of exhibits.

Messrs. Shanks & Co., of Barrhead, near Glasgow (Stand 523), show some good water-closets, including a self-acting encased closet, of which the basin is encased in an outer covering of iron. This closet, which needs no timber casing, appears to be well adapted for use in large institutions. The flushing apparatus is actuated by the movement of the seat. Among other good closets shown by this firm, we may name the "Tubal," a "wash-out," with front outlet. But at the time of our visit the closets and other apparatus at this stand were very inadequately supplied with water.

Stand 524 is, as we stated a fortnight ago, occupied by the Manchester Corporation, with models and descriptions of the apparatus in use for the disposal of refuse in that city. Some account of these will be found on p. 734, *ante*. A kindred exhibit, though of only one object, is made by the Mayor and Corporation of St. Helens, who show (525) a full-sized model of a pair of closets upon the pail-and-tub system, as in use in that borough.

Stand 526 is occupied by closets fitted with the apparatus of the Automatic Disinfector Company, of Queen Victoria-street. This consists of a globular receiver, placed beneath the seat of the closet, and close to the basin, containing a disinfectant, some of which is injected into the water in the basin each time the closet is used. It is stated that the globular vessel when charged contains disinfecting material enough for 10,000 gallons of water. The disinfectants used appear to be two, viz., Condy's fluid or permanganate of potash, and a material known as "Anti-zymotic Crystals," which has a very agreeable perfume, though whether it is inimical to disease germs we will not undertake to say. No doubt apparatus of this kind is useful, and even essential, with bad forms of closet, but we are strongly of opinion,—an opinion to which we have given expression over and over again,—that closets which really need such "safeguarding" as is afforded by apparatus of the kind under notice should be discarded. On the other hand, it is obvious that in hot weather the use of a certain quantity of disinfectant mixed with the water which is to stand in the closet basin, is likely to be beneficial, but this can be said without losing sight of the principle that all water-closet apparatus should be self-cleansing and independent of such aids as those to which we are referring.

Mr. James Wood, of Bath (Stand 527), exhibits some portable commodes which are likely to be found very useful and effective. "Sanitas" and other disinfectants may be used, and the contents of the receptacles can be emptied without offence or exposure.

Stand 528 is occupied by Messrs. Wilcock & Co., of Burmantofts, near Leeds, with their excellent automatic-flushing school latrines, closets, &c., to which we incidentally referred last week.

Nicholls's "patent sanitary and deodorising system" is shown by Mr. Richard Nicholls at Stand 529. The system is embodied in what is called the "Anthropos" closet, which is likely to be found useful in certain situations where no drainage system is available. It is claimed that this closet not only deodorises the excreta, but converts it into a rich though dry and sweet manure. No. 1 closet is made of cast-iron, with mahogany top and back shield, and weighs about 90 lbs. complete, with copper carbon box and atmospheric deodoriser. It contains when full about 20 gallons. With fireplace complete, it can be used for consuming the contents of the dust-bin, or any vegetable matter, as well as for converting the fœces into manure. No. 2 closet consists of a copper-pan, 2 ft. by 1 ft. 6 in., containing 20 gallons, and weighing about 26 lbs. when empty. It is made with a flange, on which it rests when dropped into the "baking apparatus," so as to remain suspended over the fire. We do not remember to have seen this invention before, and have no information as to its practical results, whatever they may be.

Messrs. Dent & Hellyer (Stand 530), of Newcastle-street, Strand, have a very good and varied display of sanitary fittings and appliances, all of them of great excellence. Their patent "Optimus" valve closet as now made includes several improvements, one of them consisting in making the overflow of the basin to discharge into the vent-arm of the valve box, well above the line of the discharges through the closet, so as to prevent the fouling of the overflow trap by the entry of "back-wash," while at the same time the discharging end of the trapped overflow is open to the atmosphere through a vent-pipe. The overflow holes, as hitherto made in the basin, are abolished, and the entrance to the overflow is made direct from the top of the basin, whilst, to ensure a thorough washing of the overflow the flushing-rim is continued from the basin round the overflow arm. This closet is made with an earthenware slop-top and a lifting seat, so as to allow of its use as a urinal or slop sink. Another speciality shown by these exhibitors is Hellyer's patent "Hygenic" or "Artisan" closet, than which nothing can be simpler or better, of its kind. The shape of the basin and the arrangement of the flush are such as to ensure perfect cleanliness. This closet is also made with an earthenware slop-top. A housemaids' slop-sink, made of iron and enamelled inside, is worth attention. It is made to fit an angle, and is provided with draw-off taps for hot and cold water and with a very effective flushing or rinsing apparatus for cleansing every part of the interior surface of the sink every time it is used. Given a fair supply of water and a careful and cleanly housemaid, it would appear to be impossible for any part of this sink to become foul by the accumulation of flocculent matter. A hospital slop-sink in white earthenware is also shown at this stand, besides other useful sanitary appliances, including Hellyer's patent "Ventilating drain-syphon and sewer-interceptor," which affords a simple and effective means of disconnecting the house-drains from the sewer. A "soil-pipe disconnector," constructed on the same principle, is specially made for disconnecting soil-pipes from drains; also a "waste-receiver," for intercepting waste-pipes from the drains. Hellyer's "drain-sentinel," with inspection shaft; stoneware "rain-water shoes" and air shafts for drains; Hellyer's grease intercepting tank (very simple and effective); the "Wigmore-street" grease-trap (specially constructed for bodily removal for periodical cleansing); some cast lead traps of good section and self-cleansing; and some sections of old D-traps which serve to show the capabilities of this form of trap as depositories of filth, go to make up a very useful and instructive list of exhibits.

Stand 531 is occupied by Messrs. T. & W. Farmiloe, of Westminster, who have a good assortment of plumbers' brasswork and water fittings. Their "Simplex" valve closet is provided with a "weeping-pipe" from supply to overflow arm, by which means water is passed into the overflow trap each time the basin is charged with water. Another speciality at this stand is the "Westminster" valveless syphon water waste preventer, which is one of the best appliances of its kind, being exceedingly simple in principle. This cistern is now made in cast iron, and provided with galvanised iron or copper fittings.

Messrs. Henry Owen, & Co. (Stand 532), of Croydon and Kensington, exhibit a number of their patent ventilating sanitary appliances, one of which is their valve closet No 3. In this the basin and trap are combined, standing clear of the floor. The outlet from the basin is at the front, while the discharge from the trap is at the back, having at its highest point a ventilating pipe taken through to the open air, thus preventing the possibility of syphonage. The water is retained in and discharged from the basin by means of a vertical valve working upon a centre above the water-line, and by which means the valve is thrown clear of all deposit upon the handle being raised for discharging the contents of the basin. Other closets made by Mr. Owen are provided with means for ventilating both basin and trap. A very useful article for many situations is Owen's patent lavatory, slop-sink, and trapped urinal combined.

Stand 533 is occupied by Mr. William Smeaton, of Drury-court, Strand, who shows, besides water-closets and other fittings, some good plumbers' work.

We must reserve for a third notice the remainder of the exhibits in Class XXIII.

MACHINERY IN MOTION.

There is a very fair show of machinery in motion in the Exhibition, some of the displays being remarkably complete. The great fault about the collection, taken as a whole, is, that it is not a representative one, considering that the object of the Exhibition is the promotion of health. Nevertheless many of the exhibits among the machinery in motion, as will be seen from the following description, have an important bearing on the preservation of health, and this is especially the case with regard to the ventilating fans and other appliances suitable for use in the Dwelling, the School, or the Workshop.

The largest and most attractive stand in the Western Gallery (where the bulk of the machinery is placed) is that of Messrs. Allen & Sons, the well-known manufacturing confectioners, who show the whole process of making those articles generally known amongst children as "sweets." Their bearing on the health of the community is not very great, at least they

scarcely tend to produce good health, and Messrs. Allen & Sons can hardly intend their exhibit to act as a warning to youthful *gourmets*. Messrs. J. & J. Colman, the widely-advertised mustard-makers, are close by, and show a mustard-mill in operation. The process is simple in the extreme. The seed is first crushed between a pair of horizontal rollers, and thence is passed to a species of stamp-mill of the most primitive design. All that remains is to sift and pack the produce, which processes are carried out at the Exhibition. The stand occupies a good deal of space. Whether this is proportionate to the bearing of mustard on human health we need not stop to inquire, as the exhibit serves its purpose of creating a great deal of interest amongst the visitors. Mineral waters have a large space allotted to them, three firms each making a big display. Mr. J. Galloway, of Bolton, shows a soda-water machine, which will produce 60,000 bottles a day; in addition to which he has some smaller apparatus. He also exhibits filling-machines, gas generators, holders, and purifiers; syrup-boilers and other appliances used in the manufacture of aërated waters. Adjoining this stand, Messrs. Hayward Tyler & Co., of Whitecross-street, show a complete plant for the manufacture of aërated waters of various kinds, in which special attention has been paid to the best means of avoiding all forms of contamination. The machinery shown on this stand is noticeable for the excellence of its finish. Messrs. Barnett & Foster have the most important display of this class of machinery, comprising a factory for the manufacture of aërated drinks, which are made, bottled, and distributed daily in the ordinary way of trade. The output of this compact factory forms no inconsiderable item in the daily returns. The influence that aërated waters have on health, like that of sweetmeats and mustard, is not very great, but there is one feature shown on Messrs. Barnett & Foster's stand which undoubtedly brings it well within the scope of a Health Exhibition. This consists of a beer-aërating machine, by means of which light beers can be bottled and preserved in a sparkling condition. Proceeding to the opposite end of the western gallery, we find a large and important exhibit consisting of a number of laundry appliances shown by Messrs. Bradford & Co. These are both for domestic use and trade purposes. The exhibitors have paid special attention to the fitting of steam laundries. Washing-machines, centrifugal drying-machines, wringing-machines, drying-closets, disinfecting apparatus, and other appliances are shown. Next to this stand Messrs. Cleaver & Sons exhibit soap partly in process of manufacture, a stamping-machine being the most noticeable object. Close by, the Blackman Air Propeller Ventilating Company show four of their ventilating fans, the largest being 48 in. in diameter. This, it is said, will move 35,000 cubic feet of air per minute by means of 2 h.-p. A small apartment is fitted up, which will be ventilated by a 48-in. propeller blowing air in, whilst a 36-in. propeller exhausts from the room. A 16-in. propeller discharges into the apartment through a distributing apparatus and is driven by an electro-motor through the current used for lighting the Exhibition, or by a galvanic battery. These fans appear to be well adapted, as we observed not long ago, for providing efficient means of ventilation to factories and workshops of all kinds. Messrs. Waygood & Co., of Great Dover-street, have some working examples of lifts and hoists, and also a model of a hydraulic-balanced passenger-lift. Some of their safety appliances are ingenious and effective; an automatic means of obtaining a reciprocating motion of a lift is also shown. Messrs. Beare, Goswell, & Co., of Southwark-street, exhibit Faulder's patent gas-heated coffee-roaster. Gas is said to offer many advantages over coke for the purposes of coffee roasting. The machines exhibited on this stand are easily placed and require no brick setting. A small centrifugal fan is used for forcing air in with the gas, so as to produce as nearly as possible perfect combustion. The machine shown is rotated by power, and is suitable for a shop or large establishment. Smaller machines, to work by hand, and better fitted for ordinary domestic use, are made. A means is provided for taking a sample of the roast whilst the machine is at work; a hollow scoop, like a cheese-taster, which forms the axis of the cylinder, can be withdrawn, and with it a certain quantity of the beans. The superiority of freshly-roasted coffee over that which has been done some time is very great; the cost of sufficient gas to roast 1 cwt. of coffee is said to average 4d. per hour. Messrs. H. Aland & Son show fan-blowers and exhausters, one of large size, 3 ft. 6 in. diameter, suitable for colliery purposes. Perhaps a more interesting feature is that of their portable hand or power ventilating-fans. These are mounted on an iron frame fitted with wheels in front, and two handles for pushing the whole along, much in the same way as a portable garden-watering machine. Some of the fans are double-geared, and are worked by a rotary motion like an ordinary winch. For farm purposes they would be very useful, especially since the introduction of the method of ventilating hay-stacks by fans. Mr. James Howarth shows radial screw ventilators, and other appliances for ventilating purposes. Mr. George Seagrave exhibits a hot-wind generator and Stewart's high-pressure blower, in which two blades revolve within a cylinder at varying velocities and round a central shaft. The velocities are controlled by an eccentric crosshead acting upon crank arms outside the cylinder, and in this way the air drawn in at every revolution is again forced out. Messrs. Heyes, Lloyd, & Shuttleworth show several examples of wringers, mangles, washing machines, and other laundry appliances. Messrs. T. Harvey & Co. exhibit a process of soap-making suitable for domestic purposes. It consists of simply mixing together Greenbank's double-refined 98 per cent. caustic soda (for which Messrs. Harvey & Co. are agents) and the surplus grease from the kitchen; and the soap is made. The exhibit is admitted into the machinery-in-motion department by virtue of a stamping apparatus used for putting the name on the cakes of soap. Mr. W. A. Gibbs, of Chingford, shows a large working model of a wheat-dryer. The apparatus consists of a brick casing in which a coke fire is made, by which air is heated and is then carried by a centrifugal fan into air-ducts travelling through a sloping revolving cylinder. The grain or other substance to be operated upon is fed into this cylinder by means of a hopper. The cylinder is lined with a number of cells. As it revolves the grain is poured out of these cells down a series of inclined planes formed by the air-ducts. In this way a gentle but continuous motion is obtained. Besides conditioning grain the machines have been used for drying tea, vegetables, cocoa, starch products, chemicals, &c. An especially large machine has lately been made for drying the apple-pulp which remains after cider-pressing. Messrs. H. Stopes & Co., of Southwark-street, exhibit Saladin's "Echangeur," an apparatus used for cooling air on gas. A perforated metal cylinder is half immersed in a trough of water, and is then caused to revolve. Air is driven by a fan into the interior of the revolving-cylinder, and escaping through the wet-perforated walls is cooled more or less according to the temperature of the water. The dryness of the air supplied also affects the result, as heat is absorbed by any evaporation of moisture that takes place. Several of the perforated cylinders may be placed one inside another to increase the cooling surface of the apparatus. Another interesting exhibit on this stand is Schaffer's magnetic screen, which is used for extracting pieces of iron or steel from amongst wheat, malt, rice, barley, &c. Malt made from English barley often contains three nails to two quarters: since the introduction of mechanical sheaf-binding small pieces of wire are constantly found amongst grain, and these get into the mills, and are often the source of considerable danger, to say nothing of the harm done to the flour by the finely-divided metallic particles. That the magnetic screen will arrest these seems evident from the samples of iron displayed, which had been obtained in ordinary work. Nails, bolts, nuts, screws, and even a 1 lb. iron weight are shown. The latter was secured by a screen working at Courage's Brewery. Several interesting mechanical appliances connected with clothing are shown. Messrs. Harry Aublet & Co.'s cloth-cutting machine will cut out several thicknesses of cloth or other material, the apparatus consists simply of a band-saw or a band straight-edged knife worked by power or hand. The saw, or, rather, serrated knife, is used for corduroy, moleskin, or other thick materials. Messrs. Podger & Davey's collar and cuff ironing machine is shown at work. It is heated by steam or gas, and driven by power. The cost of heating by gas is stated to be 2d. per day, and it is stated to be capable of turning out 180 doz. collars and cuffs per day. Messrs. Davey & Fabian also show a mechanical ironing machine at work. This is used for table-linen and large surfaces of that nature. The article to be operated upon is passed over a revolving-roller. The latter is covered by the concave under surface of the steam-heated iron, which has a short reciprocating motion parallel with the axis of the roller, and therefore normal to the travel of the latter. A compound movement is thus obtained, which is very effective in smoothing the cloth. We noticed this machine when shown at a former exhibition.

The motive power for all these machines is supplied by a large pair of W. & J. Galloway & Son's horizontal compound automatic expansion engines, fitted with a parabolic governor. The high-pressure cylinder is 14 in., and the low-pressure 24 in. in diameter; the stroke being 2 ft. 6 in. These engines do not work with a condenser, as there was found to be a difficulty in obtaining sufficient refrigerating water, so the exhaust is carried into the chimney-stack. The two Galloway boilers are placed in an adjoining building. They are 26 ft. long by 6 ft. 6 in. in diameter, and are suitable for working at 80 lb. pressure. They are made of steel throughout, both plates and rivets; the rivet-holes being drilled with the plates in position. These boilers are an excellent example of workmanship.

Besides the machinery in the West Gallery, there are several exhibits of the nature grouped in the neighbourhood. The chief of these are in the West Annexe. Entering by the north door, and having passed the two large Galloway boilers already referred to, we notice one of G. T. Blundell & Co.'s large water-witch pumps mounted on wheels for transport. This is intended for farm or agricultural purposes, or it would make a very powerful fire-engine, supposing steam could be obtained for it. Adjoining this pump Christy & Co. show an artificial system of hatching and rearing fowls, the pretty callow chicks, which seem to make their appearance every day, being curiously out of keeping with their very practical surroundings. The system shown is that introduced by Miss May Arnold, and is a development of the French method which for many years was, and probably is now, successfully moved on a commercial scale. Hot water is used for supplying the necessary heat, so that a uniform temperature can be obtained. The eggs are cooled *in situ* by a flush of air, and the nest is at all times stationary. The large number of deformed chicks obtained by the old form of apparatus is attributed to the disturbance of the eggs in the process of hatching. Messrs. Christy's exhibit is a pretty and interesting one, but appears a little out of place in the Machinery-in-motion department.

The next stand is devoted to the partial illustration of candle-making, which is exhibited by Price's Patent Candle Company, who show at work a candle-moulding machine of what we believe is an entirely novel form.

Messrs. Siebe, Gorman & Co. show a dry-air refrigerator and an ice-making machine worked on the ether principle.

Mr. William Whiteley, the "Universal Provider," has on view a van for conveyance of provisions, which is fitted with an ingenious arrangement for working a ventilating fan direct from the wheels of the van. As it is not possible in the exhibition to actuate the machinery by means of its ordinary motive power, an attachment has been made to a small Bischoff gas engine, which works on to a temporary pulley placed outside.

The London Guelph Patent Cask Company have a large stand, on which special machinery used in cask-making is shown, beside examples of the casks made on their system. Lawrence & Co., Limited, show a good collection of capillary refrigerators for cooling milk. The action of this apparatus may be reversed, and it can be equally well used for heating purposes. In this way it is applied for concentrating syrups, juices, and such matters. The most interesting exhibit on this stand, however, is an ingenious machine by which ordinary fat can be globulated, so that it will become thoroughly incorporated with milk. With one of these machines skim milk can be enriched, the inventor says, so that it will produce excellent cheese. Those who are aware what hard tasteless stuff skim milk cheese is will appreciate the advantage of Mr. Lawrence's invention. Messrs. Hughes &

Lancaster, of Chester, show an example of Shone's pneumatic ejector. This is an apparatus by which an occasional flush of sewage is obtained in place of the sulliage being allowed to flow gradually into the sewer, and so be likely to accumulate and create an obstruction. The ejector consists of an air-tight receiver into which the sewage gravitates, and by the filling of which a suitable mechanism is called into play to admit a charge of compressed air, and so force the sewage to any desirable height or distance, according to the pressure used. In the Exhibition an air-pump such as is used for the Westinghouse brake is employed to get the required pressure. The system was applied two years to the purpose of removing and carrying out to sea the sewage of Eastbourne. It is also in use in some other towns for removing sewage and other purposes. It is said to be very well adapted for lifting water in factories, mines, &c. In Worthing it has been applied for lifting sea-water to water the streets and flush the sewers. Shone's flush tank or hydraulic house-sewage ejector is also shown on this stand. It consists of a tank for the reception of all domestic waste liquids, and into which the discharge from the water-closet passes directly. From the bottom of the tank a pipe is led which passes upwards, and is bent over the side into a syphon, the long leg being connected with the house-drain. A tumbling basin placed above receives a stream of water from a special pipe, or is fed by the waste-water of lavatories or baths. When the tumbling basin is full it turns over automatically, and in doing so fills the syphon, which in turn will empty the tank on any sewage matter that may have collected in it. In this way it will be seen that a periodical flush is obtained in place of the feeble and attenuated stream from which so many evils arise. Suitable ventilating pipes are placed in the ejector, the communication between it and the sewer is trapped in the usual way.

Messrs. J. & E. Hall, of Dartford, and the Haslam Fonndry, of Derby, both exhibit dry-air refrigerating machines in operation. The former firm has lately brought out a new form of apparatus in which a good many improvements may be noticed. The question of preserving food by refrigeration is, however, one which deserves more than a passing notice, and we hope to return to it at another time. The Machinery and Hardware Company have a small building adjoining the West Gallery. Here they show some machine tools, which, no doubt, possess the merit of cheapness. They have a small pair of compound condensing yacht engines of a pattern similar to those exhibited by J. Copley & Co., of Middlesbrough, at a recent machinery exhibition. A horizontal single cylinder engine, boilers, spanners, machine belting, the "Koh-i-noor" gas apparatus, pulleys, and various other objects complete this firm's exhibits.

No mention of the machinery in motion, however brief, should be made without referring to the Otto gas engines, supplied by Crossley Brothers, Limited, of Manchester. These engines are to be seen in all parts of the Exhibition where there is machinery to be set in motion,—in the bakeries, dairies, for pumping sea water into the aquarium, for electric lighting, and in many other situations. We recently had an opportunity of making a careful inspection of the new factory which this firm has erected at Openshaw, and the special tools there laid down expressly for making the Otto gas engine. We notice that one or two important improvements have been made since the last big display of these engines in the Fisheries Exhibition. Probably the most noticeable is the self-starting apparatus. This was a feature very much wanted in the gas engine until the Crossley and other appliances were lately introduced.

SCHOOL BUILDINGS AND ACCESSORIES.

Class XXXIV. of Group 4 is devoted to designs and models of improved buildings for elementary schools, infants' schools, and *crèches*. Here, indeed, the schoolmaster is very much abroad, and many of the exhibitors are either altogether unrepresented, or wandering away in remote parts of the building, where it is almost impossible to find them, and it is equally difficult to classify the exhibits that can be found. The first names that appear in the catalogue are those of a few architects who send, with one or two exceptions, commonplace drawings of ordinary school buildings which show in no case special provisions as to sanitary or healthful requirements. These drawings, as they are here shown, are to be found in the main entrance-hall, intermingled with designs for semi-detached villas and country-houses of a very ordinary type. But leaving these and following the catalogue as nearly as we can, we come, under the heading of "Apparatus for Warming, Ventilating, and Lighting Schools, &c.," to the heating-apparatus of Mr. A. B. Reck (1,279), of Copenhagen, who shows a thoughtful construction of stoves for heating and ventilating by means of hot air. The inventor claims success in every respect, and the minor points of construction are certainly attended to, as will be seen on examining the carefully-prepared diagrams and the specimens exhibited. One of these stoves is about to be put into actual working in the building, when we shall have a fair opportunity of estimating its value according to results, and as it appears to have been largely used in various buildings in Denmark, and competes in price with other systems, it bids fair to hold its own. The London Warming and Ventilating Company (1,280) show their well-known "Gurney" stove, which has proved to be practical and efficient, requiring no more than a passing notice. Messrs. J. Weeks & Co. (1,281) have nothing new to present, but send specimens of their tubular boilers and hydro-caloric coil, which are capable of working with facility in large edifices, in addition to the use to which they are put in horticultural buildings, and to which they were first applied. Messrs. Herring & Son (1,282) give a model to half-inch scale of the warming and ventilating apparatus on the downward flow system,—of which the flow and return pipes, as well as the branches, are of 8 in. diameter,—used for the City of London School, in which the arrangement is well shown. In absolute working we believe that this apparatus has thoroughly answered the requirements. Many other exhibitors of like systems are down in the catalogue, but are not to be found in their places, and if, in the meantime, they rally their forces and wish to be represented, they should do so without delay. A few further scattered exhibits are shown, but of no great interest. Amongst them may be mentioned a model of a Swedish gymnasium of very unattractive interior, and also very incomplete, so much so that we wonder greatly at its appearance here, as it has no bearing upon the subject in any way. An exception to this, and in every way its superior, is seen at Stand 1,304, occupied by Adolf A. Stempel, who sends some good gymnastic apparatus and a very good model and photograph of the interior of a gymnasium, which looks far more workmanlike and suitable and worth the attention of advocates of muscularity. Another good exhibit in this section is sent by Oscar Knofe (1,307), who has the lion's share of space allotted to this class of exhibits, but which is creditably filled with all the apparatus pertaining to the expenditure of energy, which one often thinks might be directed in a more beneficial and, perhaps, more profitable direction; although this is in a measure met by the introduction here of a selection of tennis, racquets, cricketing material, and such like, which to the average English mind must be of the greater interest. Dr. Roth (1,296) brings together a miscellaneous collection bearing upon health and deformity in many ways, and shows us what to do and what to avoid, by means of models and diagrams, examples of food, dress, and furniture, and directions for the treatment and preservation of the senses, more particularly sight and hearing. Turning to a very different subject, we find Mr. William White's "Hygeian Rock" building composition, to which we have previously referred in the *Builder*. Its usefulness in more ways than one is already recognised, and for school building its properties can be turned to good account where economy of space and the ratepayers money are to be (as they should always be) considered. This brings us to the end of a group which seems to have been unaccountably neglected or entirely overlooked by many who might have had a good opportunity of showing us much that is useful and new, and we find a great deal of space wasted which would have been undoubtedly appreciated by many other exhibitors, to their own advantage as well as to that of the visitors to the Exhibition.

CONFERENCES.

Conferences, on the subjects stated below, will be held during the course of the Exhibition, under the auspices of the societies mentioned. They will be open free to all visitors to the Exhibition. Dates and other details will be announced shortly:—

Royal Institute of British Architects.—"Construction of Houses with regard to Sanitary Arrangements."

Social Science Association.—"Sanitary Legislation."

Society of Arts.—"Water Supply and Distribution."

Society of Medical Officers of Health; Parkes Museum of Hygiene; Sanitary Institute of Great Britain. These three Institutions are amalgamated for the purpose of a conference.—"Domestic Sanitation in the Urban and Rural Districts"; "Industrial Diseases"; "How Infectious Diseases are Spread"; "Notification of Infectious Diseases"; "Disposal of the Dead,—Cremation."

National Health Society.—Some subject cognate to the work of the Society.

Mansion House Council on the Dwellings of the Poor.—"Dwellings for the Poor."

Epidemiological Society.—"Tropical Sanitation."

Society of Telegraph Engineers and Electricians.—"Electric Lighting: Municipal and Domestic." Or on other subjects connected with applications of electrical science.

Medical Society of London.—"The Effect on the Health of Teachers and Children of Overwork in Schools."

St. John's Ambulance Association; National Society for Aid to Sick and Wounded in War.—"Ambulance Work in Peace and War."

Central Chamber of Agriculture.—"Meat Supply."

Association for the Oral Instruction of the Deaf and Dumb.—"Oral Instruction of the Deaf and Dumb."

Institute of Chemistry.—"Food Adulteration and Analysis."

British Bee-keeper's Association.—"Bee-keeping generally."

In reference to our remarks in last supplement (under heading "Sanitary House Decoration and Accessories" about some drawings of mosaic which were hardly up to the mark as "show drawings," Messrs. Diespeker & Co. write that these were not so intended, but were sketches of arrangements made for the approval of architects, and with a practical purpose only.

HEALTH EXHIBITION.

MR. RICHARD ANDERSON, F.C.S., author of "Lightning Conductors: their History, Nature, and Mode of Application," makes a Speciality of Testing the Efficient Action of Lightning Conductors; and of giving Advice as to the best mode of applying the Apparatus for the Protection of Public and Private Buildings.—Leadenhall House, 101, Leadenhall-street, E.C.

Group III. Class XXII. South Annexe.
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[See p. xxii.

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